2004 SUMMER INDEX - WI-2

INTRODUCTION

The fish community of Lake Superior has changed dramatically over the last 40 years. A fishery supported by the extensive stocking of native and non-native species has been replaced gradually by one maintained through the natural reproduction of native species. Although native species have been rehabilitated in many areas, a potential future concern for the fish assemblage of Lake Superior is the incidental introduction of exotic species. Changes in fish population characteristics must be analyzed over the long term to better understand the effects of these ecosystem disruptions. Summer index is intended to monitor various population dynamics (e.g. abundance, population structure) of the Lake Superior fisheries and to record potential shifts in the fish community structure.

METHODS

During even numbered years, thirty-nine stations were sampled in the Apostle Islands (WI-2) (Figure 1) with the R/V *Hack Noyes*. Each site was sampled with 3,600 ft of monofiliment graded-mesh gill net. Each gang had twelve 300-ft nets arranged in the following mesh (in) sequence: 5, 2, 4, 1.5, 6, 4.5, 2.5, 7, 3.5, 6.5, 3, and 5.5. Nets were set for one night (24 hr) at each station.

During odd numbered years, nineteen stations were sampled in the western waters (WI-1) (Figure 1) with the R/V *Hack Noyes*. Each site was sampled with 3,600 ft of monofiliment graded mesh gill net. Each gang had twelve 300-ft nets arranged in the following mesh (in) sequence: 5, 2, 4, 1.5, 6, 4.5, 2.5, 7, 3.5, 6.5, 3, and 5.5. Nets were set for one night (24 hr) at each station.

All live fish were measured (total length), checked for sea lamprey marks and fin-clips (lake trout), and then released. Dead piscivorous fish were processed in the same manner except stomach contents were collected, individual weights were taken when lake conditions permitted, scale and otoliths were removed. Aging structures were taken from other species as conditions permitted. Sub samples of the other species were measured (total length) and the remaining fish were counted.

Geometric mean catch-per-unit-effort (GMCPUE) was calculated using only catch data from the stations that were established in the early 1970s (15 stations in WI-1, 11 stations in WI-2). These stations have the longest data sets and allow for examination of long term trends. For all other calculations and summaries (e.g. length frequency, mean length), data from all stations were used.

RESULTS/DISCUSSION

CATCH STATISTICS

In 2004, 500 lake trout were captured in WI-2 (93.4% were wild fish) (Figure 2). Mean lengths of native and hatchery lake trout were 20.1 in (SD = 5.4) and 22.4 in (SD = 6.2), respectively. Geometric mean catch-per-unit-effort of pre-recruit native lake trout (<17 in from 2.0-2.5 in mesh) decreased slightly from 2002 to 2004 (Figure 3). Total native lake trout GMCPUE (all meshes) increased from 2002 to 2004 (Figure 4).

During 2004, 1,917 whitefish were captured in WI-2. Mean length of 1,580 whitefish was 15.8 in (SD = 4.0)(Figure 5). Pre-recruit whitefish (<17 in from 2.0-2.5 in mesh) GMCPUE decreased from 2002 to 2004 (Figure 6). Total whitefish GMCPUE (all meshes), however, increased from 2002 to 2004 (Figure 7).

During sampling, 359 round whitefish were captured. The mean length of 285 round whitefish was 13.5 in (SD = 2.8)(Figure 8). Round whitefish GMCPUE (from 2.0-2.5 in mesh) decreased from 2002 to 2004 (Figure 9). Until recently, round whitefish were a commercially important species. Round whitefish GMCPUE, however, was greater during the 1970s when commercial harvest was much larger.

In 2004, 1,574 lake herring were captured. The mean length of 576 lake herring was 11.3 in (SD = 2.3)(Figure 10). In addition, 547 other ciscos were captured, which included the bloater, shortjaw, kiyi, and various hybrids. Catch-per-unit-effort (CPUE) of ciscos (including herring) has increased since the 1970s but has been annually variable (Figure 11). Herring GMCPUE from the one inch mesh has provided time lag (two years) indicator of year class strength since 1970s (Figure 12 and 13).

Eighty-eight smelt were captured, their mean length was 9.2 in (SD=1). Smelt GMCPUE has declined dramatically since the 1970s (Figure 14).

Thirty burbot were captured, their mean length was 19.3 in (SD = 6.3). Burbot GMCPUE has declined steadily since the 1970s (Figure 15).

In 2004, 188 siscowet lake trout were captured, their mean length was 20.6 in (SD = 4.7)(Figure 16). Geometric mean catch-per-unit-effort of siscowet lake trout increased from 2002 to 2004 (Figure 17).

Four lake sturgeon were captured in WI-2 (23.4, 24.4, 30.2, and 30.8 in). Although GMCPUE was not calculated for WI-2 (few lake sturgeons caught annually), values from WI-1 have increased since the mid-1990s (Figure 18). Increased GMCPUE are due to the extensive stocking program initiated in 1983 within the St. Louis River.

Since the 1970s commercially important native species such as lake trout and whitefish have increased dramatically due to more conservative regulations, refuge areas, and sea lamprey control. The prominent forage species has shifted from the exotic smelt (which primarily inhabits near shore areas) to the native lake herring. The success of native species rehabilitation and the subsequent change in the forage base may be negatively affecting the current stocking programs. For example, stocked species such as brown trout, splake, and Chinook salmon may have poorer survival due to lower smelt abundance and competition with native species. In 2004, brown trout and splake were stocked offshore in an attempt to enhance survival rates and increase the return to the creel. Further reexamination of the current stocking program may still be needed as native species continue to increase.

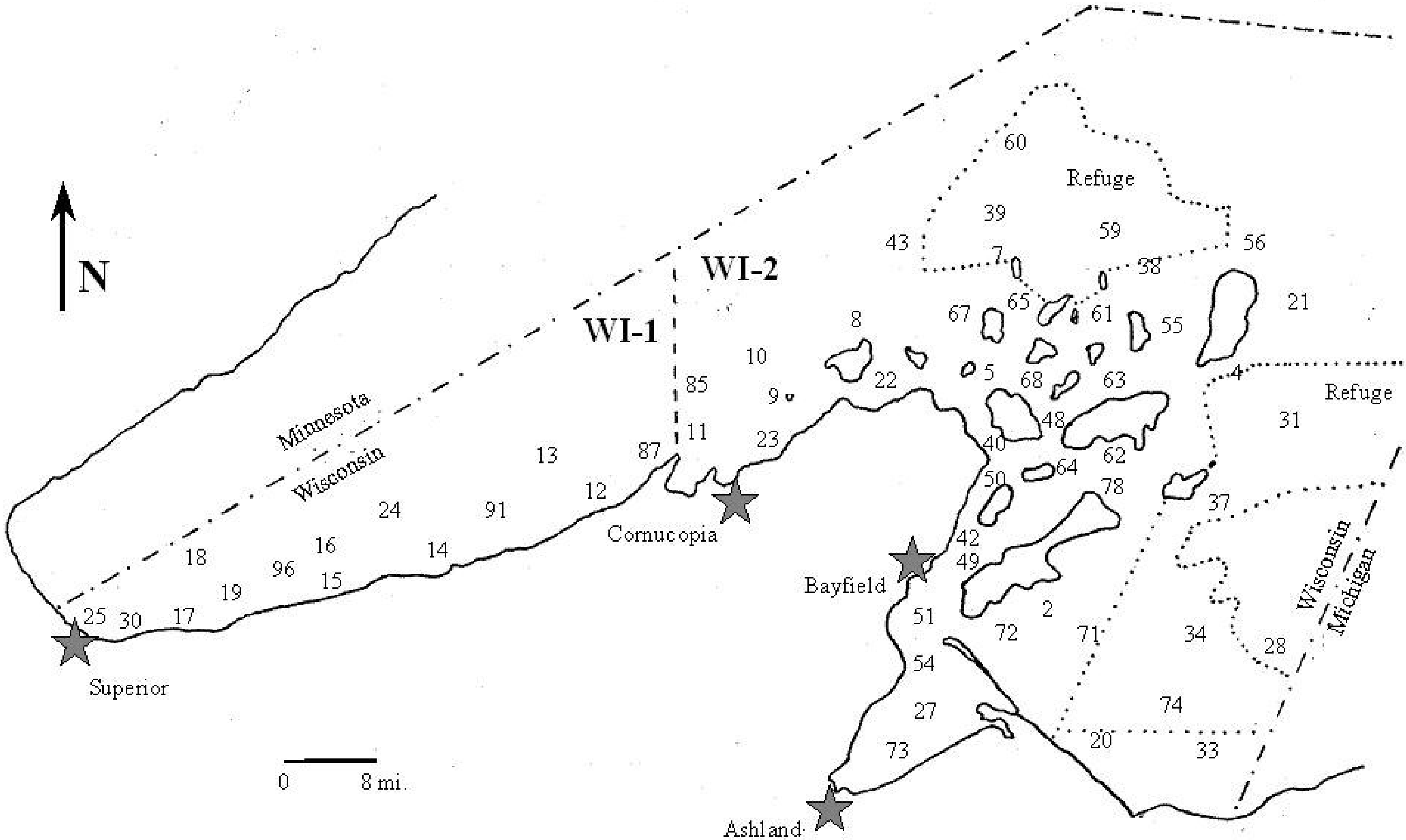

Figure 1. Summer index stations in Wisconsin waters of Lake Superior.

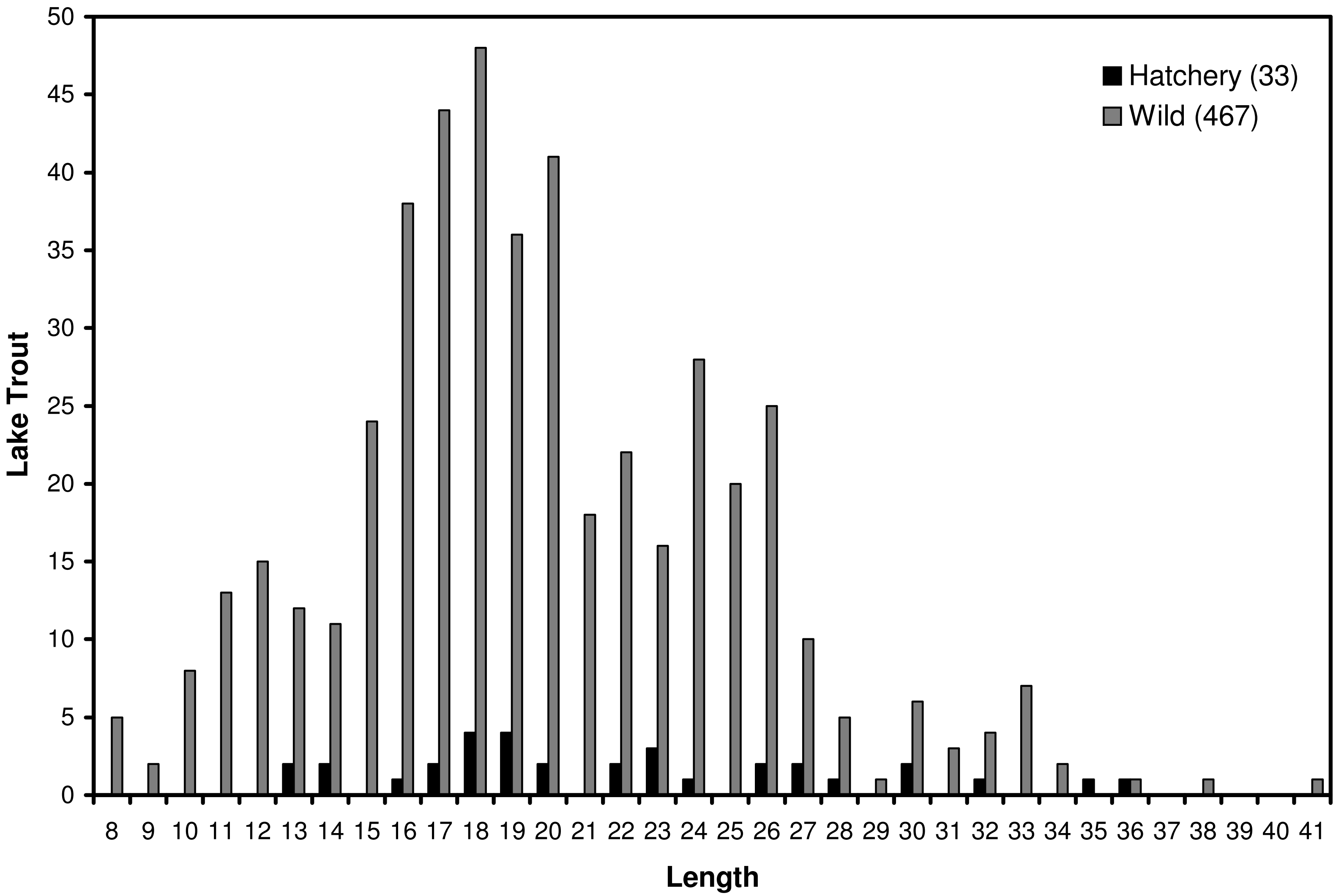

Figure 2. Length frequency of hatchery and wild lake trout captured in Summer Index (all meshes), 2004.

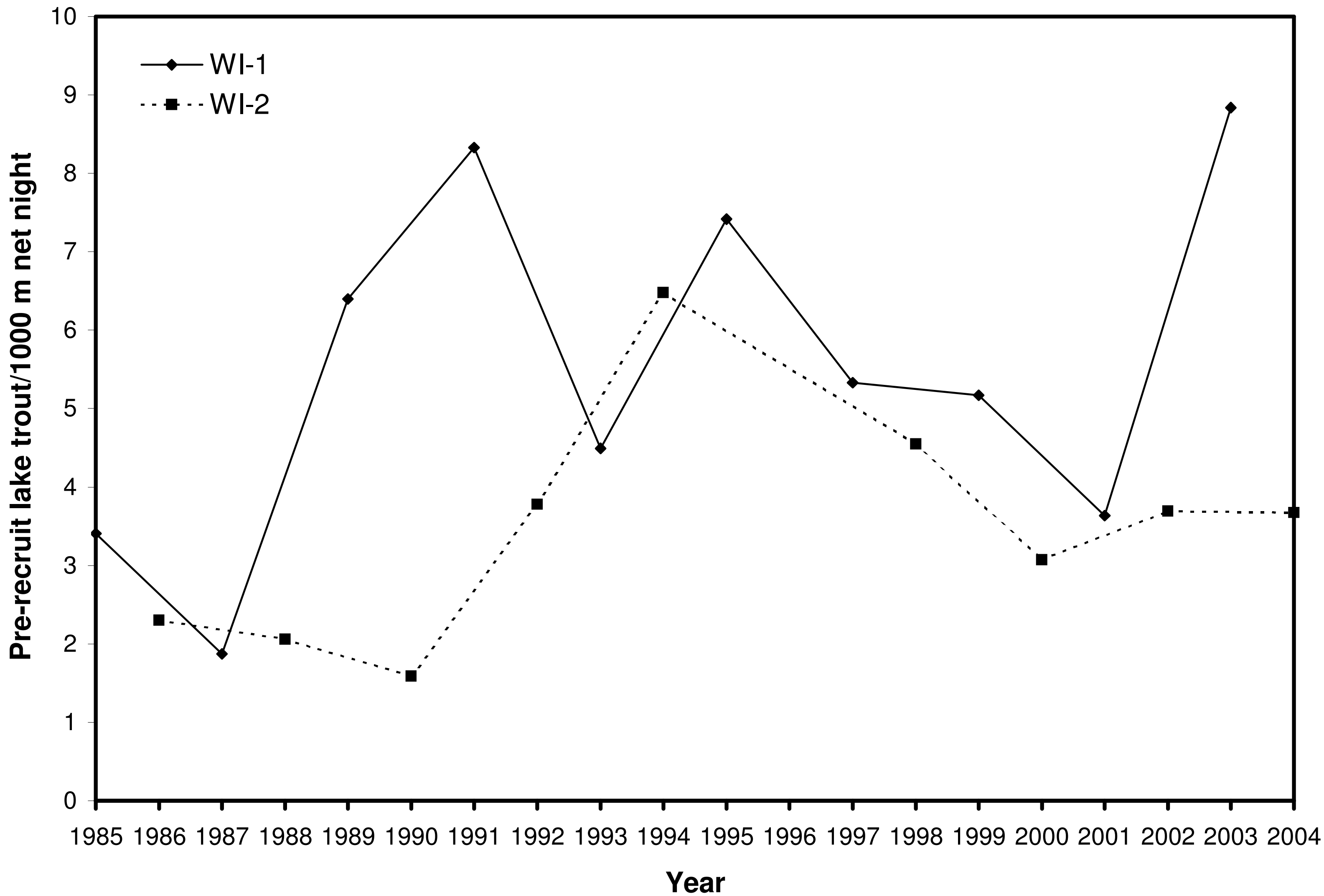

Figure 3. Geometric mean catch-per-unit-effort of pre-recruit lake trout (<17 in) from Summer Index (2.0-2.5 in mesh) in WI-1 and W-2, 1985-2004.

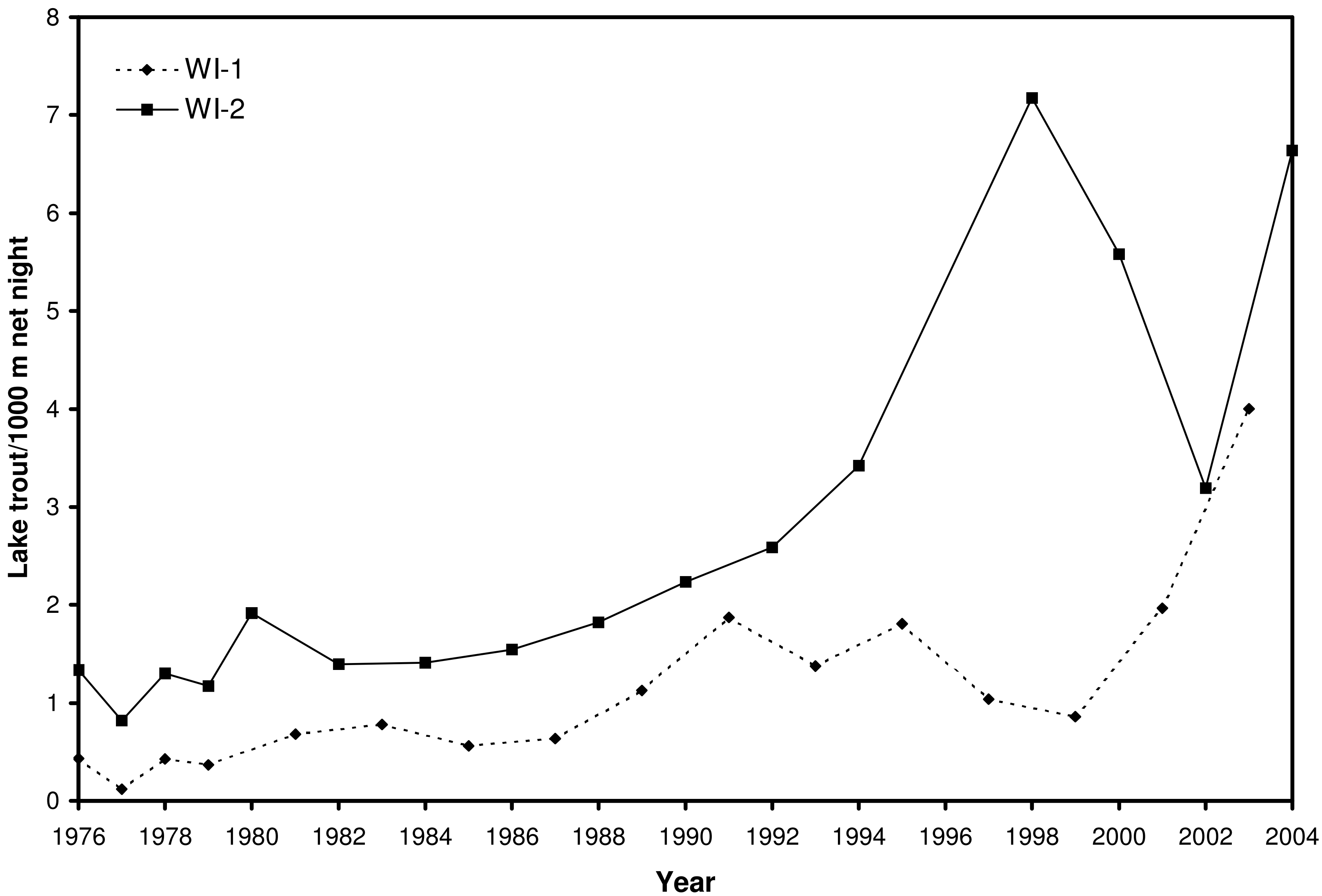

Figure 4. Geometric mean catch-per-unit-effort of lake trout from Summer Index (all meshes) in WI-1 and W-2, 1970-2004.

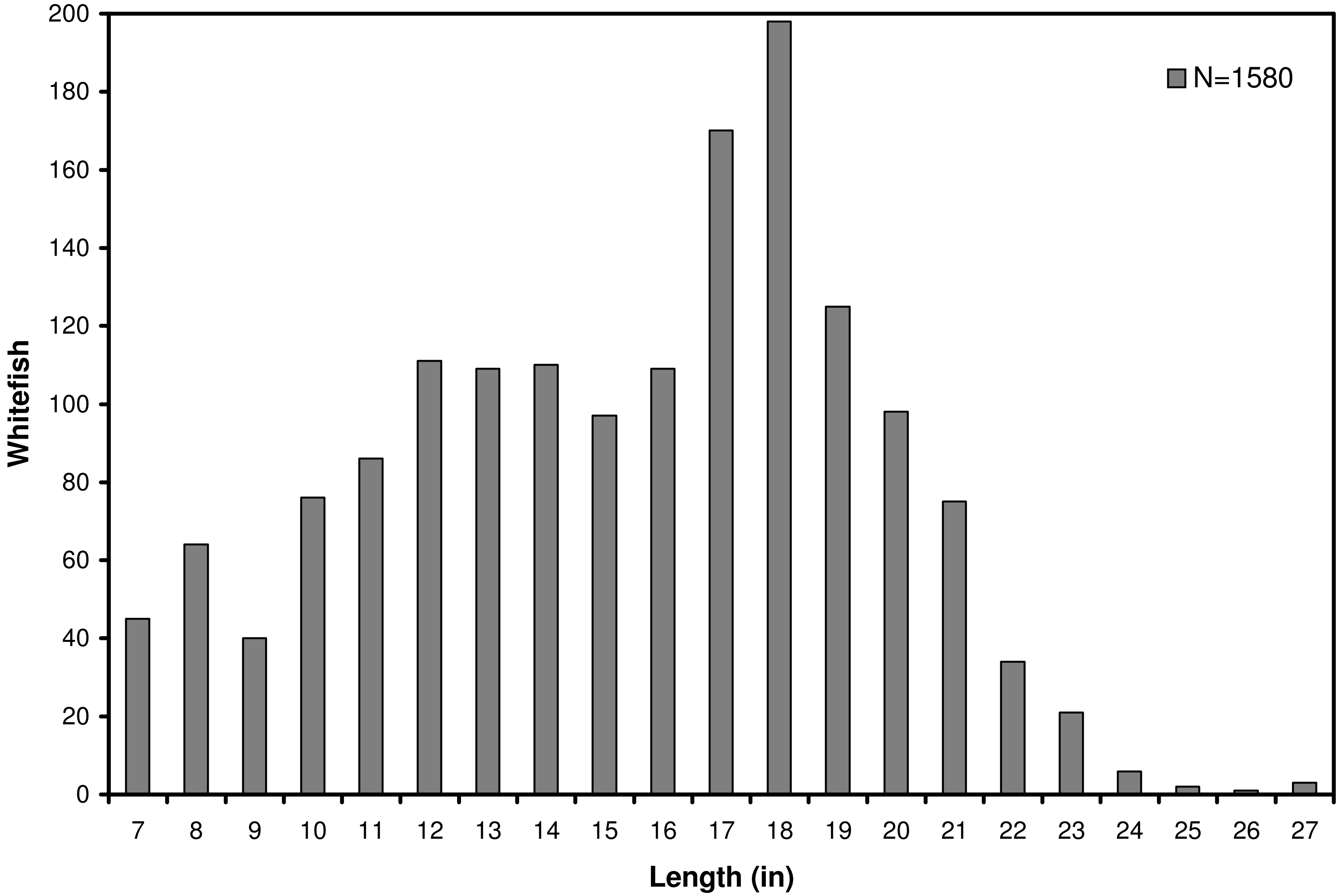

Figure 5. Length frequency of whitefish captured in Summer Index (all meshes), 2004.

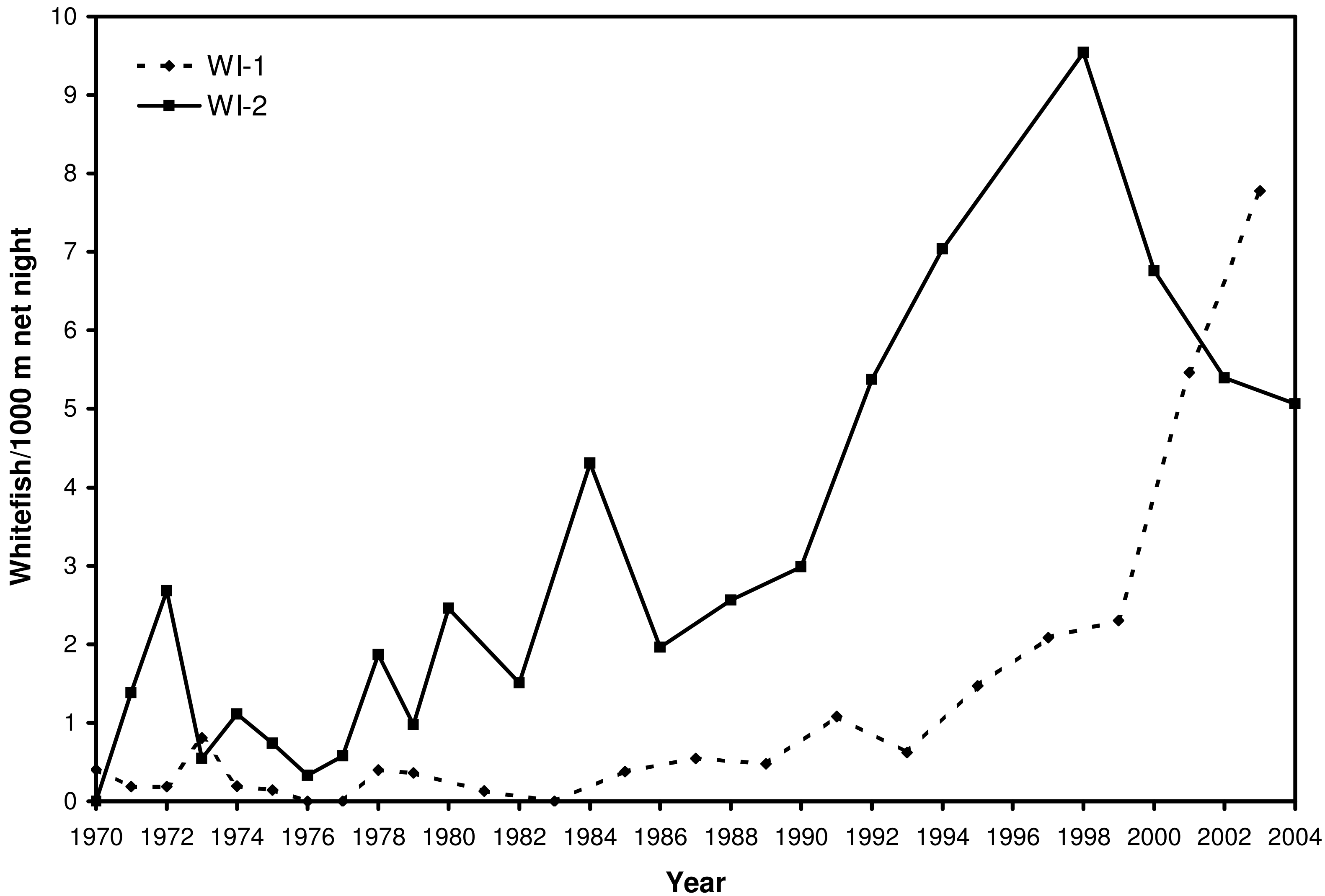

Figure 6. Geometric mean catch-per-unit-effort of pre-recruit whitefish (<17 in) from Summer Index (2.0-2.5 in mesh) in WI-1 and W-2, 1970-2004.

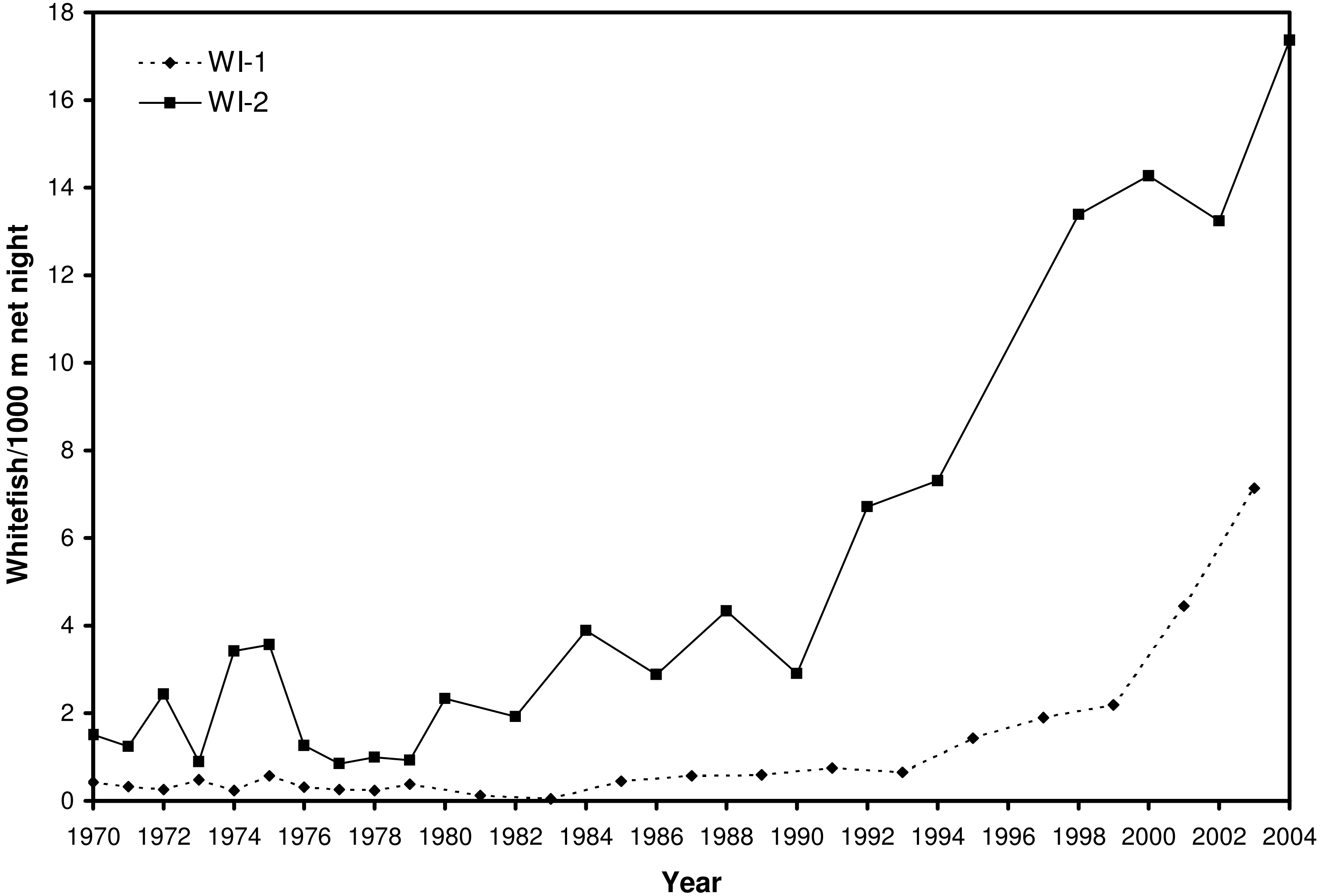

Figure 7. Geometric mean catch-per-unit-effort of whitefish from Summer Index (all meshes) in WI-1 and W-2, 1970-2004.

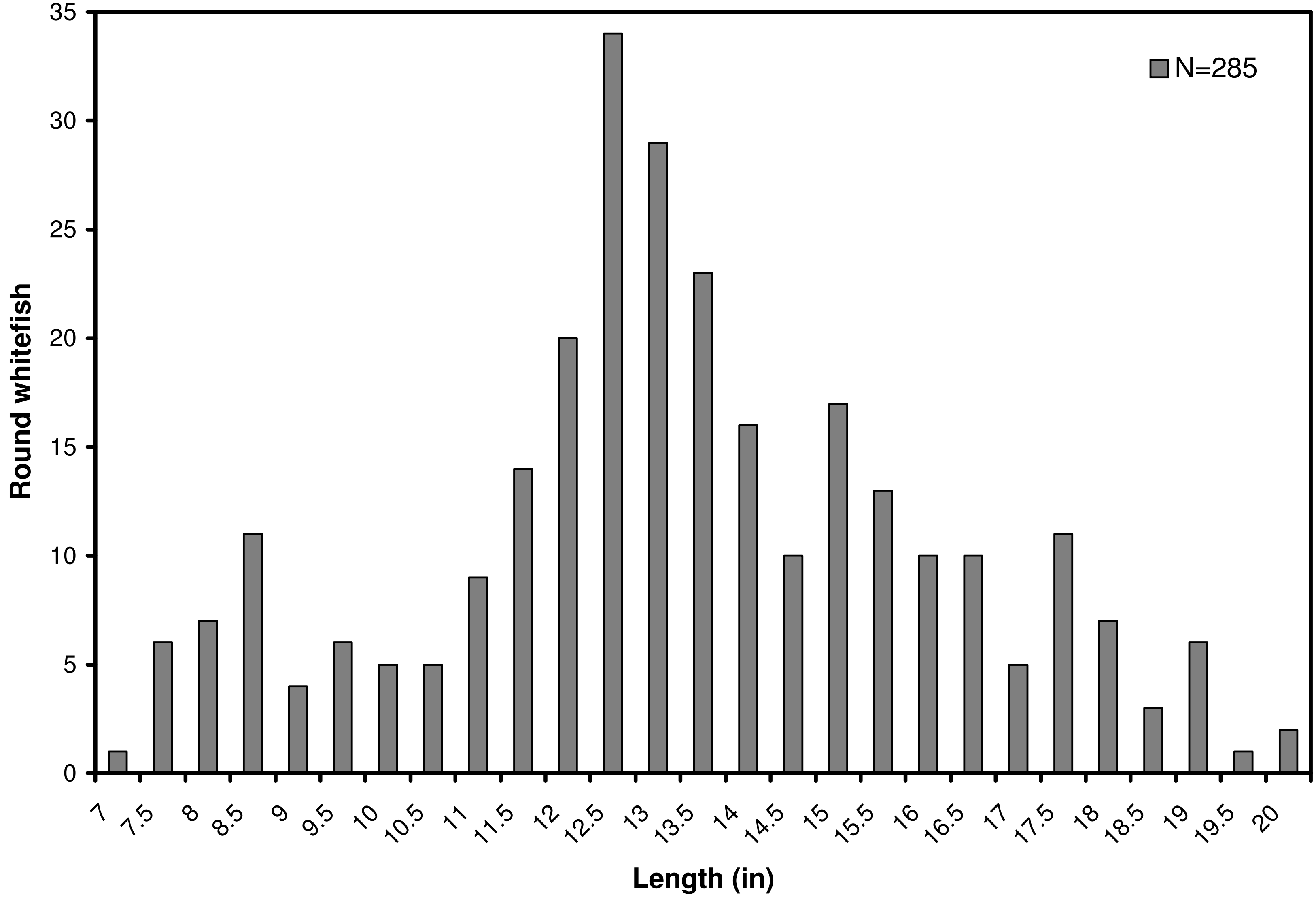

Figure 8. Length frequency of round whitefish captured in Summer Index (all meshes), 2004.

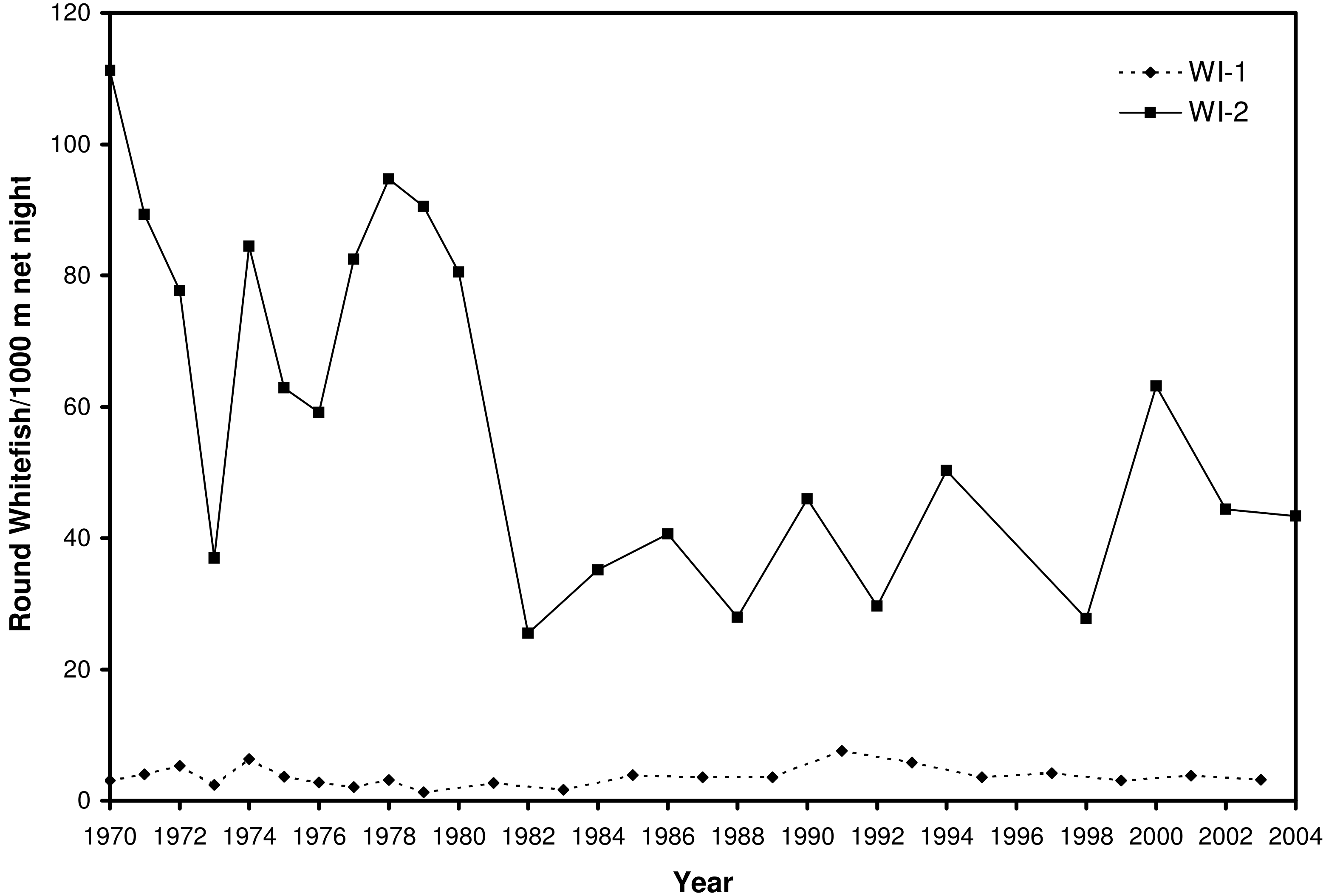

Figure 9. Geometric mean catch-per-unit-effort of round whitefish from Summer Index (from 2.0-2.5 in mesh) in WI-1 and W-2, 1970-2004.

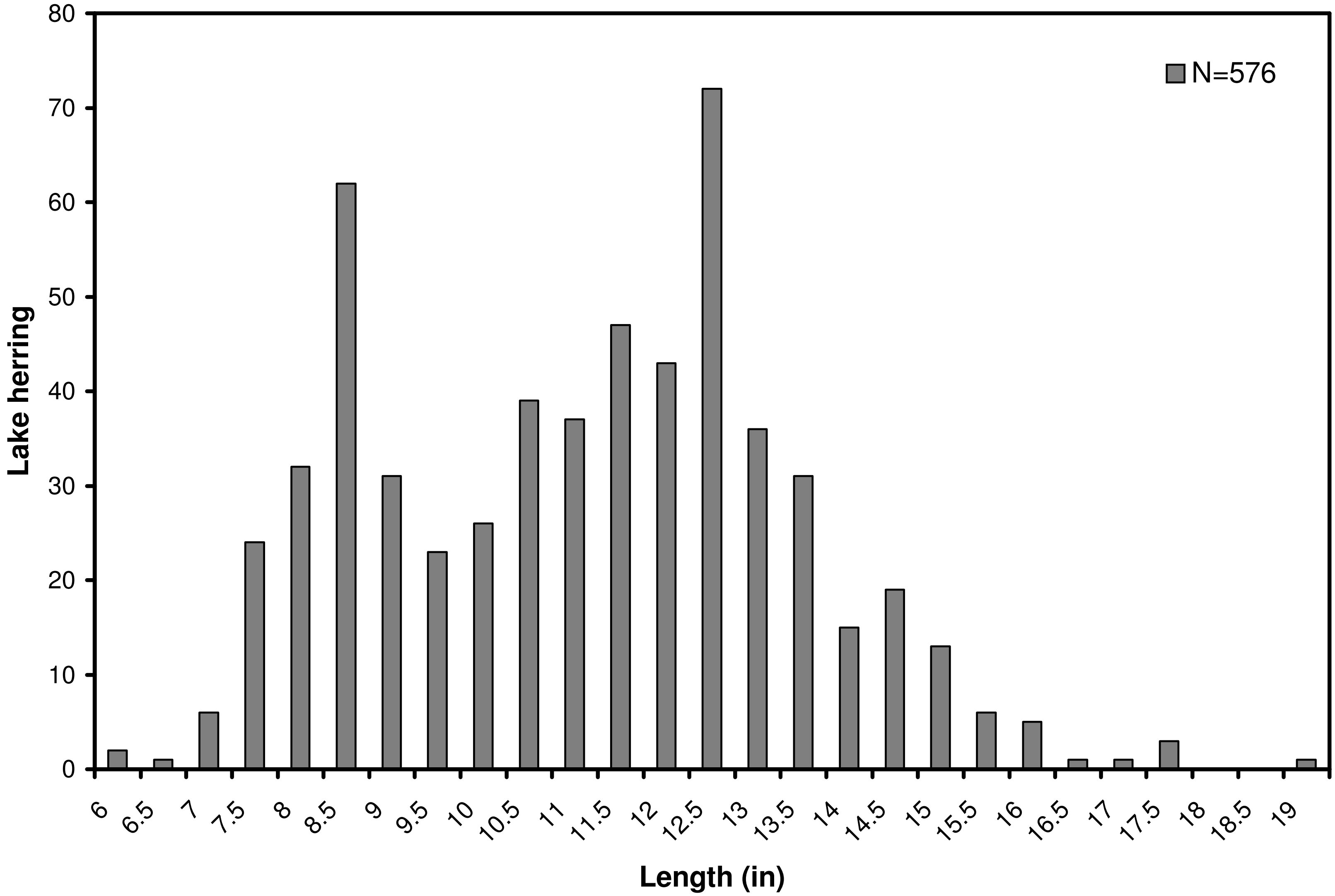

Figure 10. Length frequency of lake herring captured in Summer Index (all meshes), 2004.

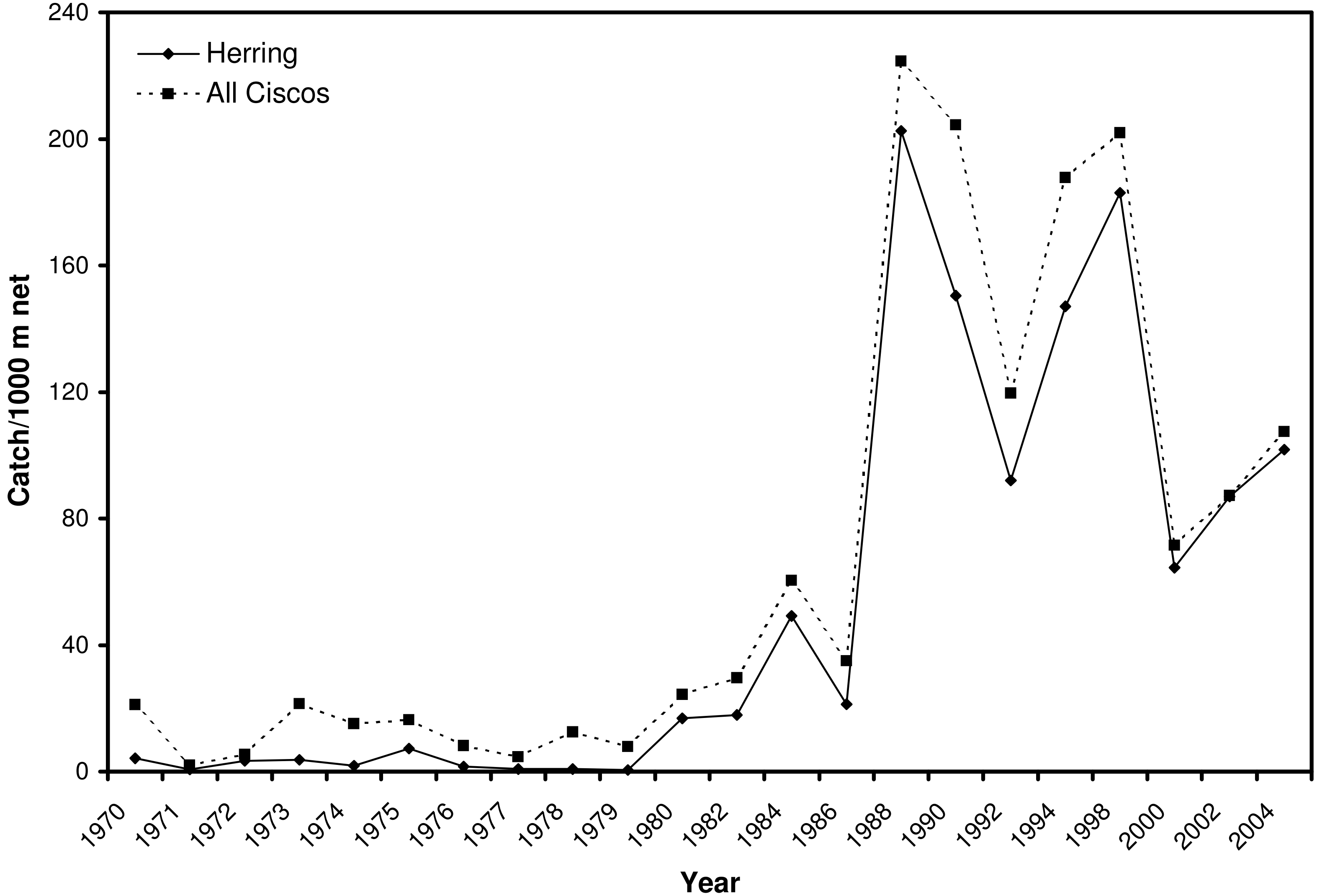

Figure 11. Catch-per-unit-effort of herring and all ciscos (including herring) from Summer Index in WI-2, 1970-2004

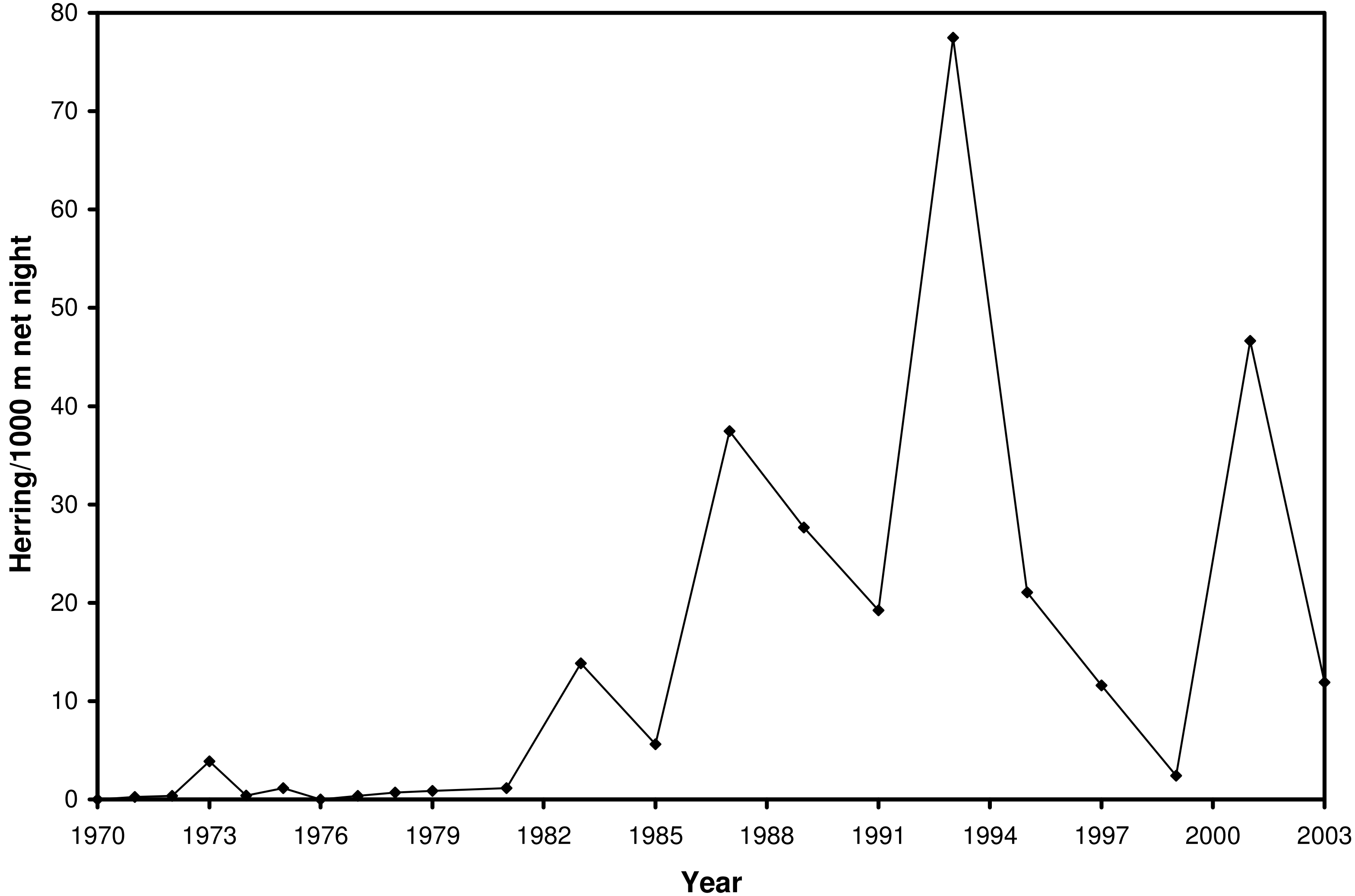

Figure 12. Geometric mean catch-per-unit-effort of herring from Summer Index (from 1.5 in mesh) in WI-1, 1970-2003.

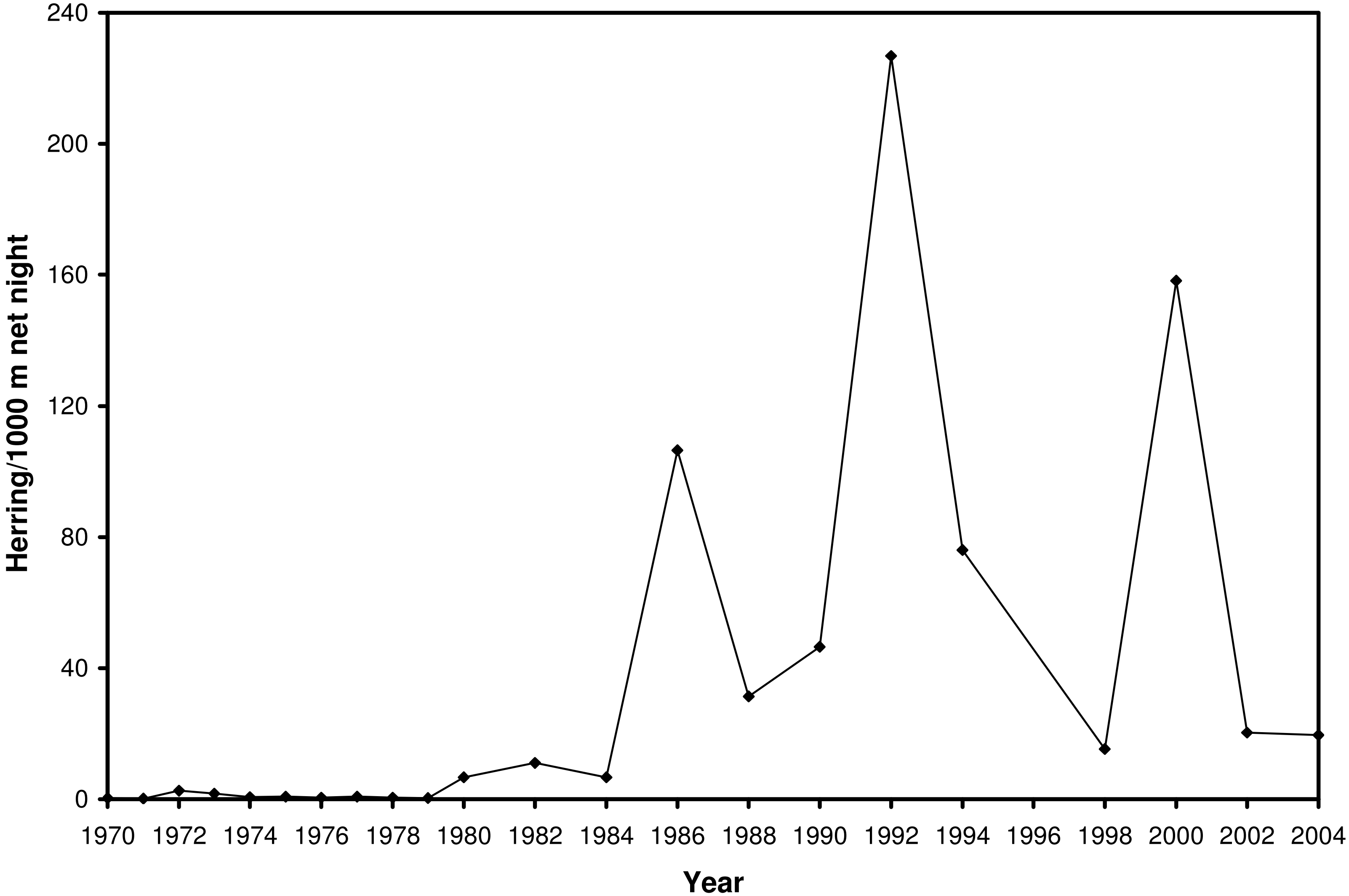

Figure 13. Geometric mean catch-per-unit-effort of herring from Summer Index (from 1.5 in mesh) in WI-2, 1970-2004.

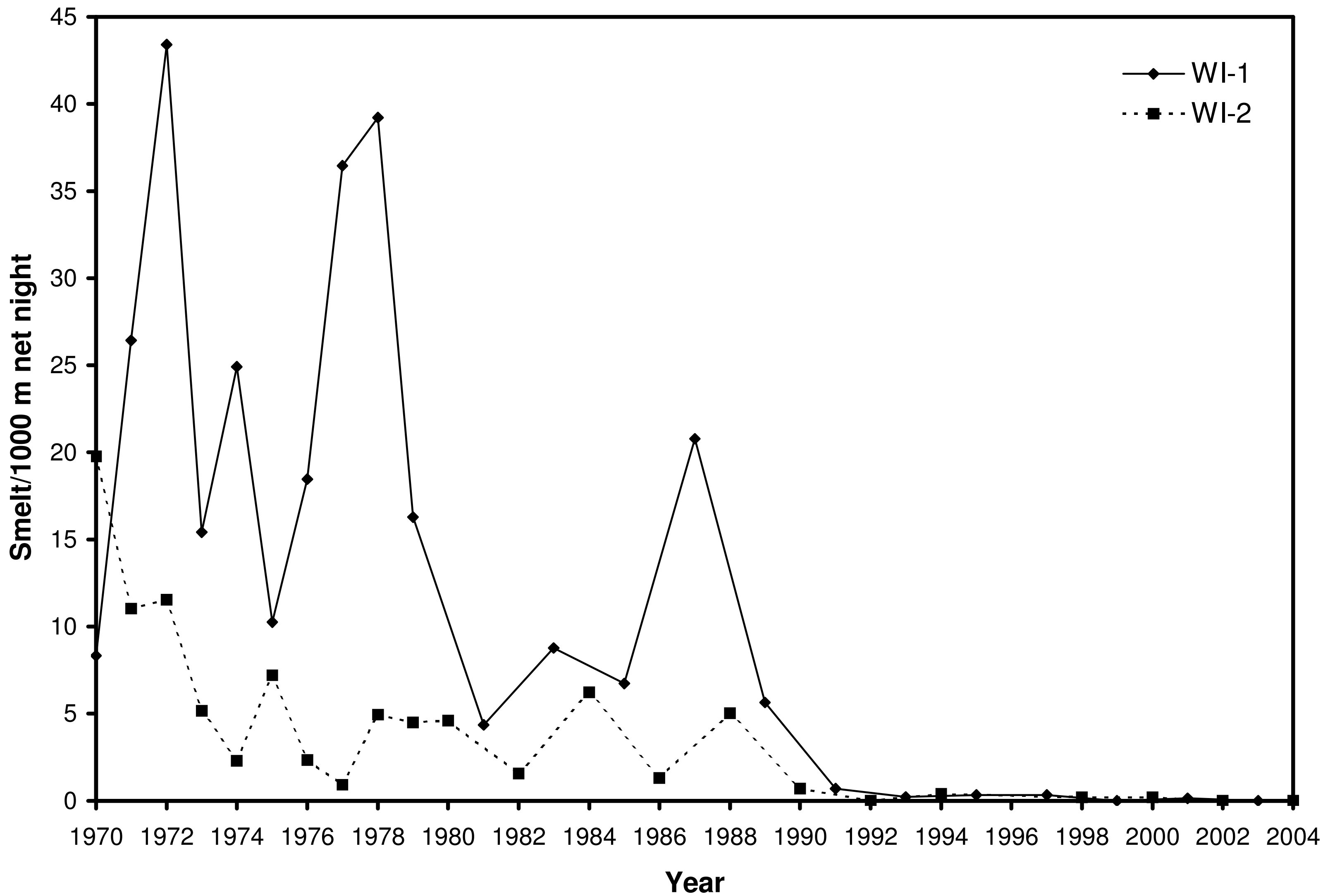

Figure 14. Geometric mean catch-per-unit-effort of smelt from Summer Index (from 2.0-2.5 in mesh) in WI-1 and W-2, 1970-2004.

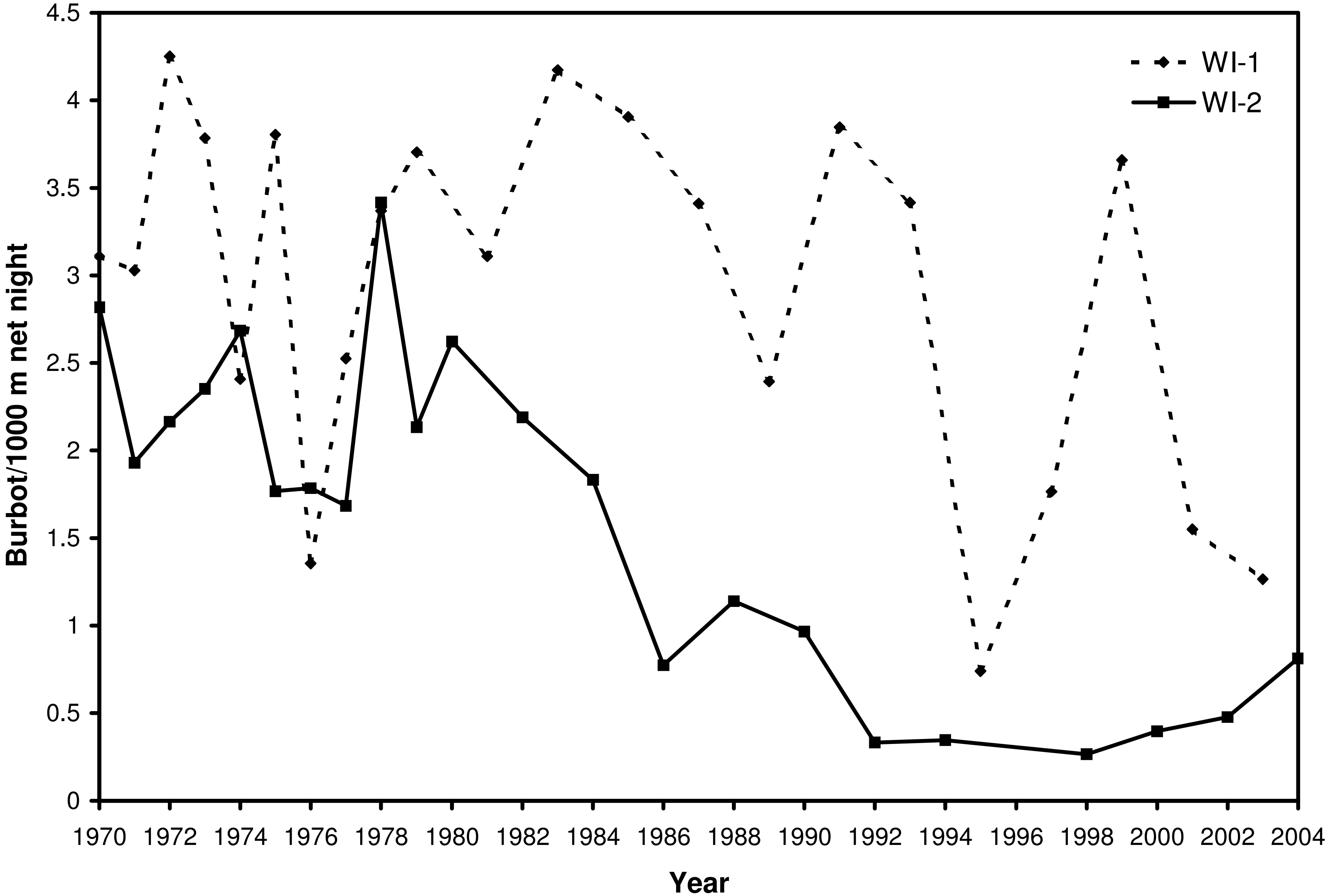

Figure 15. Geometric mean catch-per-unit-effort of burbot from Summer Index (all meshes) in WI-1 and W-2, 1970-2004.

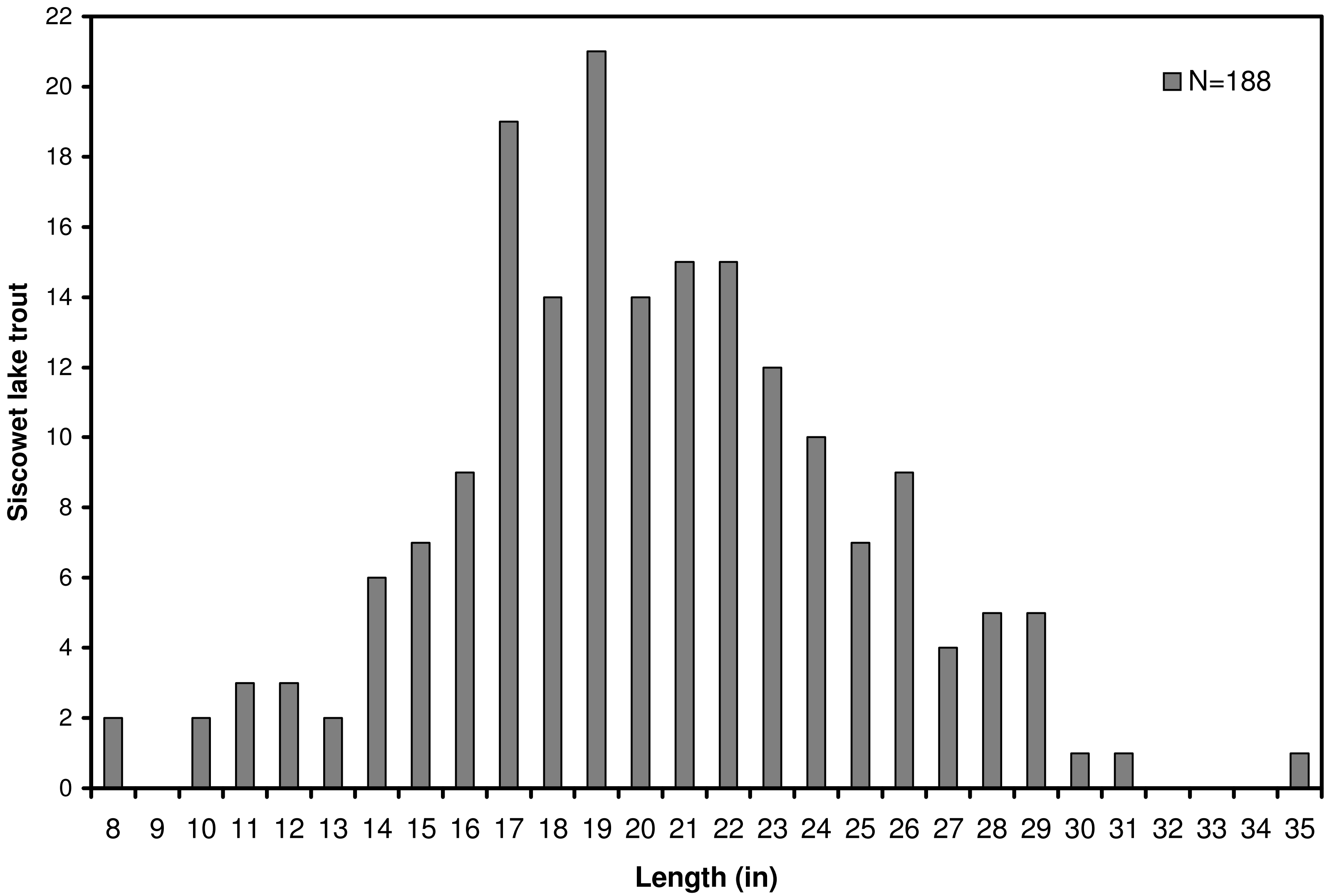

Figure 16. Length frequency of siscowet lake trout captured in Summer Index (all meshes), 2004.

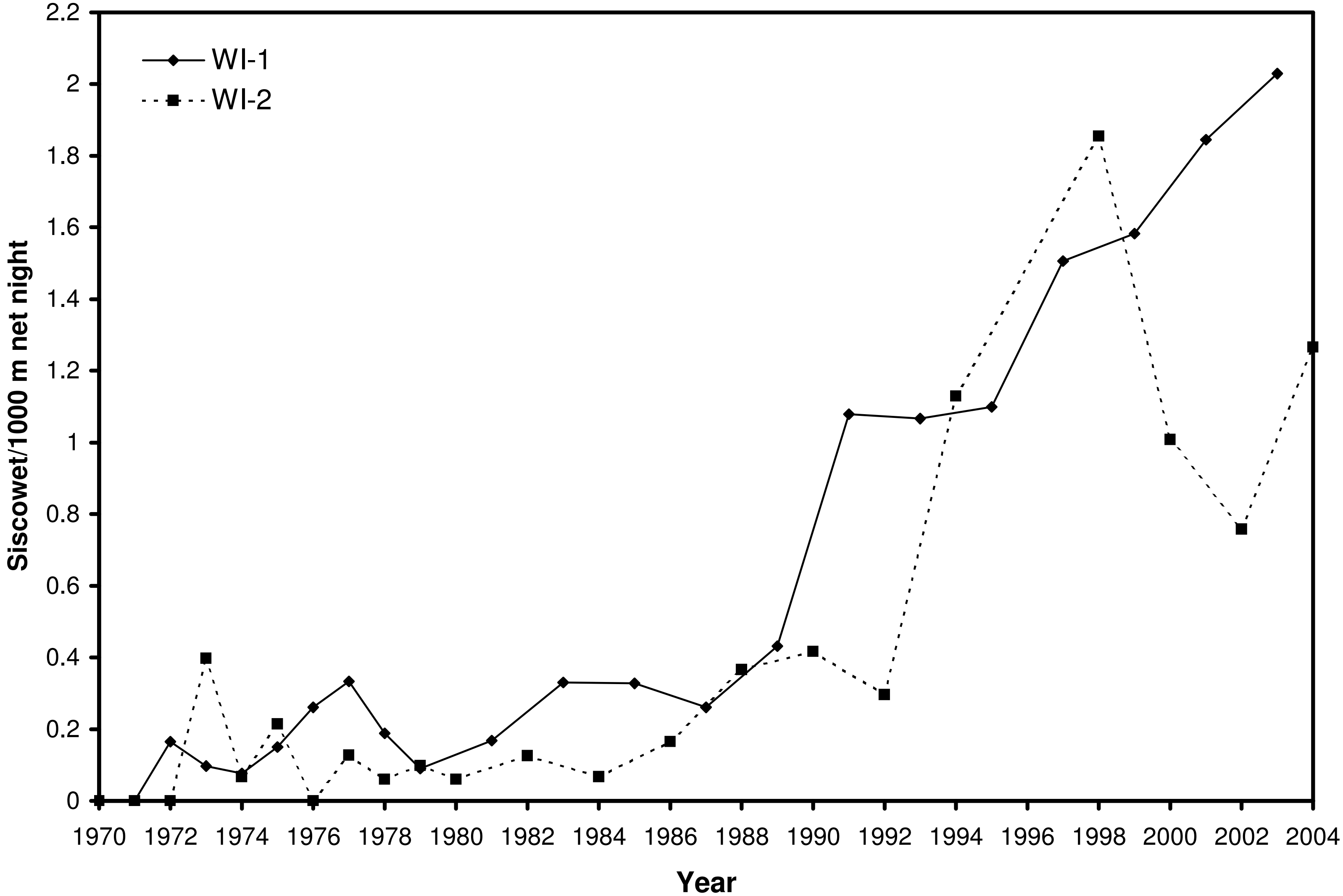

Figure 17. Geometric mean catch-per-unit-effort of siscowet lake trout from Summer Index (all meshes) in WI-1 and W-2, 1970-2004.

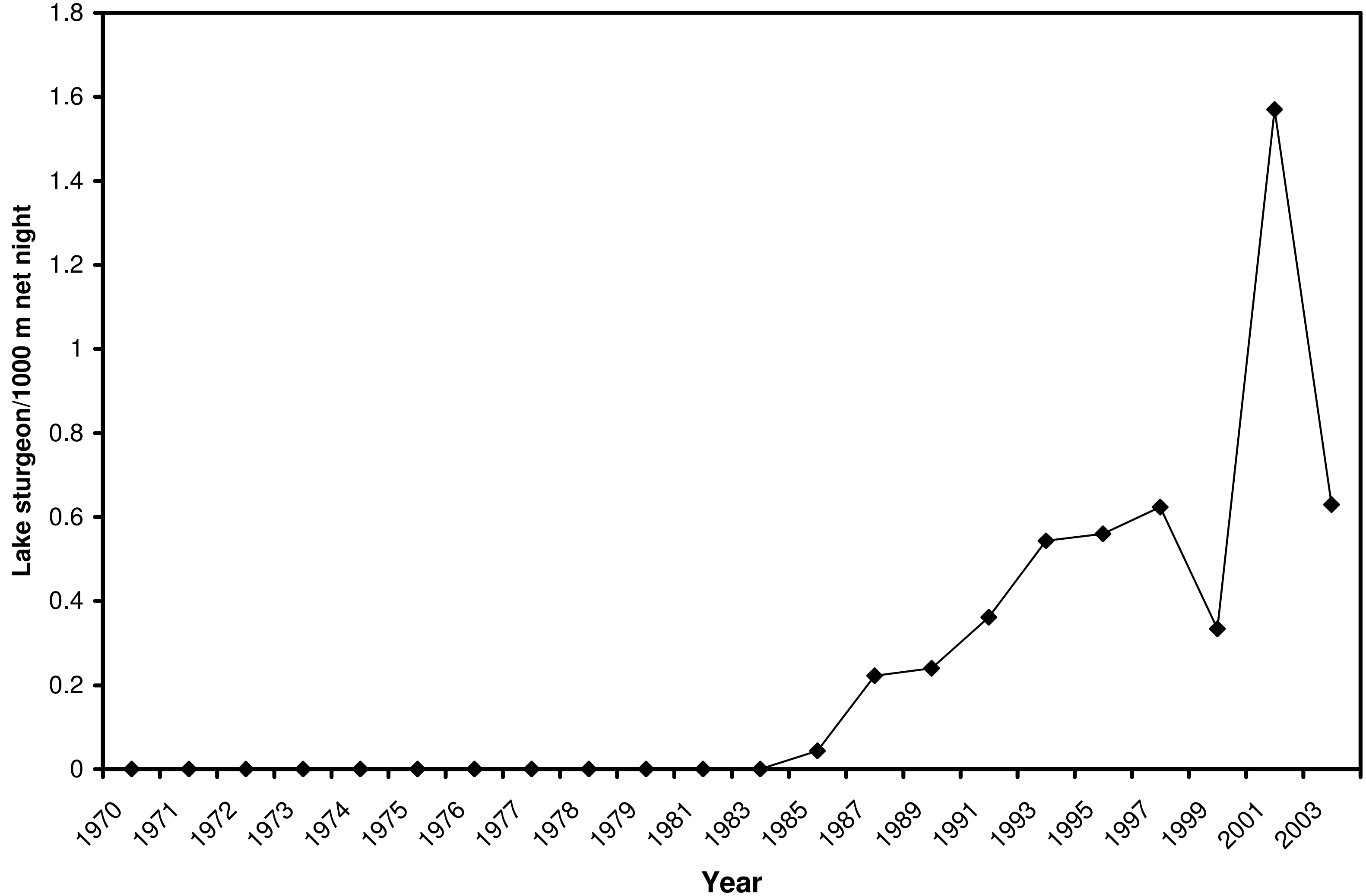

Figure 18. Geometric mean catch-per-unit-effort of lake sturgeon from Summer Index (all meshes) in WI-1, 1970-2003.